



Ø BEAT



COLO. SPRINGS,
COLORADO

FEBRUARY 1980

TRANSMITTER HUNT IS ON!

TECH TALK...

Transmitter Hunting

As you read through this month's Zero Beat looking for Grid-dip meters part 3, you'll notice its absence. Due to the enthusiasm for the up-coming transmitter hunt on March 8th, it seemed more prudent to talk about the necessities of the hunter.

The equipment needs of the transmitter hunter are usually what most 2 meter FM operators already have. If not it is easy to build or borrow. The list of equipment consists of only four major items: 1) 2 meter rig operating on 146.52Mhz, 2) Directional 2 meter antenna, 3) Step attenuator capable of 6 or 10 db steps with maximum capability of approximately 100 db total, 4) and, of course, a vehicle capable of carrying two or more people and items 1 through 3 just mentioned.

Starting with a more in depth description of the equipment, the 2 meter rig can be any rig; mobile, portable, or HT as long as it has two qualities. These qualities are a signal strength meter and an external antenna connector. Should your rig not have a meter, don't give up yet. If your rig has an external speaker or earphone jack, this will work as well using an external speaker and a VOM (volt-ohm-meter) capable of measuring AC voltage.

The directional antenna most frequently used is a 3 or 4 element YAGI (beam). The antenna is mounted on a wooden post (eg. broomstick, large dowel), vertically and the post is held out of a car window, vertically. Other antenna types used are loops, quads, and phased verticals. Loops and quads are easy to build and are similar in operation to a YAGI. Phased verticals are a little more complex to set up and the technique used in transmitter hunting is a little harder for beginners. Since yagis are the most common, most of this discussion describes them. Regardless of which type of antenna is used, two characteristics will bring you better results; 1) the antenna is resonant and properly matched (SWR as close to 1:1 to 1 as possible) and 2) it is not a heavy weight in the gain department (here again 3 to 4 elements).

The attenuator is probably the most unknown piece of equipment. By definition of its name, it is a device that attenuates (reduces) a signal by a certain amount and is measured in db's (decibels). An attenuator is more than just a resistor in series with the signal. It does add resistance in series but maintains an input and output impedance of 50 ohms. This is necessary to match the antenna and rig impedance.

Before we get too far and the fog index gets too high, let's talk about the connection of the equipment. The only difference between a transmitter hunting hook-up from one at home is the attenuator inserted between the antenna and rig, refer to figure 1.

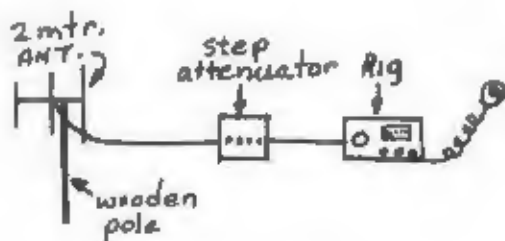


Figure 1

The object of transmitter hunting is to find the hidden transmitter. As you turn the antenna you will see the signal strength vary. Since you know which end of your antenna is the forward direction, you find the peak signal strength. You now look to see what direction your beam is heading and you have the general direction the transmitter is in.

You may notice as you turn the antenna, the meter is maximum in all directions. This is the reason for the attenuator. You start adding attenuation until you can distinguish the peak as the antenna is rotated (usually mid-scale on peaks). This also solves the problem of increased signal strength as you get closer to the transmitter.

Continued on Page 4 -

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(* Two-year board terms began November 1979)

ZERO BEAT is published monthly in the interest of the members of the Pikes Peak Radio Amateur Association, Inc., Colorado Springs, CO. Permission is given to reprint articles or excerpts provided credit is given. Deadline for submission of articles to be published is the third week of the month. Classifieds accepted anytime.

The Pikes Peak Radio Amateur Association meets on the second Wednesday of every month at Sabin Jr. High School, 3605 N. Carefree Circle at 7:30 p.m. and all amateurs and interested persons are cordially invited. The Association also conducts an informal net on all Wednesday evenings, except meeting night, on 146.52 MHz FM at 7:00 p.m.

Editor: Jim Colvin NØAVY, 4610 Topaz, Colorado Springs, CO 80918 598-7704

MINUTES — JANUARY MEETING

The meeting was called to order at 7:32 p.m. at Sabin Jr. High on January 9, 1980 by President Don Lohse, KBØKQ. Those present introduced themselves. There were 53 members and visitors present.

Dave Cook of Sat Track International presented a most interesting program on Satellite Tracking software for use with computers for those interested in using this means for locating satellites. Dave demonstrated some programs on a computer for the group. Program ended at 8:08 p.m.

The meeting was reconvened at 8:49 p.m. following a break to enjoy the donuts and coffee provided by Ken KAØDST. Don KBØKQ thanked Chuck WØRNT for the fine Christmas party and asked Dave Vierling, NØDV to extend our thanks to Rocky Mountain Limited who gave us such enjoyable entertainment.

Remember that January 26 is deadline for Zero Beat articles turned in to Jim, NØAVY or Don, KBØKQ.

Al Bailey ADØZ, education chairman, reported that we have excellent conditions at North Jr. High for our classes, thanks to Jim Mullikin, AEØH. Tuesday at 7:00 p.m. is Novice Code Classes, Thursday at 7:00 p.m. is Novice theory, Tuesday at 7:30 p.m. is upgrading theory, and Thursday at 7:30 p.m. is upgrading code. If anyone would like to volunteer to speak on any subject for theory classes contact Al, ADØZ.

The minutes for December were approved as printed in Zero Beat.

The treasurer's report by Dave WBØSDW reported \$324.88 as of January 1, 1980, with income of \$117.85 and \$77.55 for Servcom.

The February 4 Board meeting will be held at 7:30 p.m. at 4610 Topaz Dr. Ray AAØL, explained the Fox Hunt Saturday March 8 at 3:00 p.m. Prizes will be awarded — one for the winner and one for the newcomer who has never done it before. Everyone will go for pizza and beer afterward.

Next edition of Zero Beat will be dedicated to transmitter hunting to help newcomers who don't know what it is all about. Doug WBØMHP, said that newcomers will be teamed up with more experienced people so they can get acquainted with it. The frequency to be used will be 146.52. Dave WBØSDW, suggested Oak KØROL, and Al ADØZ use their special antennas.

Bud, WBØTIB, announced that anyone who has a change of address, phone number or call, let him know as things come up and it is next to impossible to get the information to people.

Net controls for the Wednesday night 52-Net at 7:00 p.m. are needed. Bud, WBØTIB volunteered for Jan. 16 and Doug WBØMHP for Jan. 23.

Servcom net meets on 37/97 on Sunday nights at 7:00 p.m.

Tom Tobiason, NØBZ, volunteered the Pikes Peak FM Assn. for the food concession at the Swap Fest. Ralph KAØGJO, volunteered to take care of the refreshments for the February meeting.

Dave NØDV announced the Novice Roundup for Feb. 1-10. There are classes for novices with less than 2 years and for perennial novices. If interested see Dave. Also need stations for novices, if you're interested in helping contact Dave. Dave Acree, WØMBZ, volunteered a rig and Frank Freil WBØPAJ offered to have novices call him and come use his station. Smitty WBØLTV, suggested novices contact someone they know locally.

Hammy Award was presented to Tom Tobiason NØBZ, on behalf of the Pikes Peak FM Assn. in appreciation of their getting the 37/97 repeater in operation and the public service this provided.

Ken Holloway KAØDST, volunteered to contact various electronics firms to get prizes for the Swap Fest, April 27.

Frank WBØPAJ, announced that the Santa Net was cancelled as there were no children in the local hospitals on Xmas.

Bud WBØTIB, asked for help on the amateur radio display for the Mall of the Bluffs. Dave NØDV, announced the 10/10 net meets at 1600 Sundays and 0300 Mondays on 28.845.

There being no further business the meeting was adjourned at 9:30 p.m.

Respectfully submitted,
Charleen, WBØYOB
standing in for Lorna WDØBTF
(ed. note: who was goofin' off)

MEMBERSHIP RENEWALS

Membership renewals are due! Anyone not up-to-date by February 29th will be dropped from Zero Beat mailing list.

WBØSDW/WBØMHP

PUZZLE ANSWER — There are 2 answers to the Puzzle.

1. I=.0101 amps, R1=98.99 ohms, R3=9799 ohms.
 2. I=98.99 amps, R1=.0101 ohms, R3=.0001 ohms.
- Pretty sneaky, huh? To complain, see Ray AAØL.

A DIGITAL S-METER FOR MOBILE SAFETY

Like many of us, I find nighttime mobile operation just a little more risky than daytime. One of the annoyances of my Clegg FM-DX 2-meter rig is its thumbnail-sized S-meter. Not only is it a non-descript "blob" of white light, but it is difficult to read meaningfully even at eye level. In assessing what is needed for useful signal strength indications, both day and night, the first consideration is safety, while the attention of the driver is shared between the traffic and the QSO. My approach was borrowed from Air Force fighter plane cockpit architecture. A pilot must divide his attention between many information inputs. Some of these inputs may become subliminal, that is, "aware of, without really concentrating on." Except for hidden transmitter hunts, or optimizing the position of the vehicle for best reception, the S-meter is "nice-to-know" information.

This project was begun two years ago, when Texas Instruments announced their SN75489 IC, later to be renamed TL489, a neat little five-level voltage comparator. With built-in precision voltage regulation as a reference, the chip contains 5 comparators, each separated by a resistive "ladder" to recognize voltage differences on a "stair-step" basis. Each comparator drives an open collector transistor capable of sinking 80 mA, enough to light an LED or a low-current incandescent lamp. Now, who wants only 5 levels? I obtained two TL489s and decided to cascade them, so I could read 10 levels. Remember the "hold-off" diode technique? A silicon diode, when conducting, drops about 0.6 to 0.7 volts across it. Why not activate the first IC with the low levels encountered up to S-5, then "hold-off" the levels that represent S-6 thru S-9+? Since the TL489 is designed to react to 200 mV, 400 mV, 600 mV, 800 mV, and 1-volt, the second TL489 should react to 1.2 volts upward. This was achieved by empirical selection of a pair of 1N4148s in series, obtaining the analog "S" signal from the same source as the first chip. Thus, an array of LEDs, 10-wide, could be driven from the S-meter signal. One nice thing about the TL489 is its high

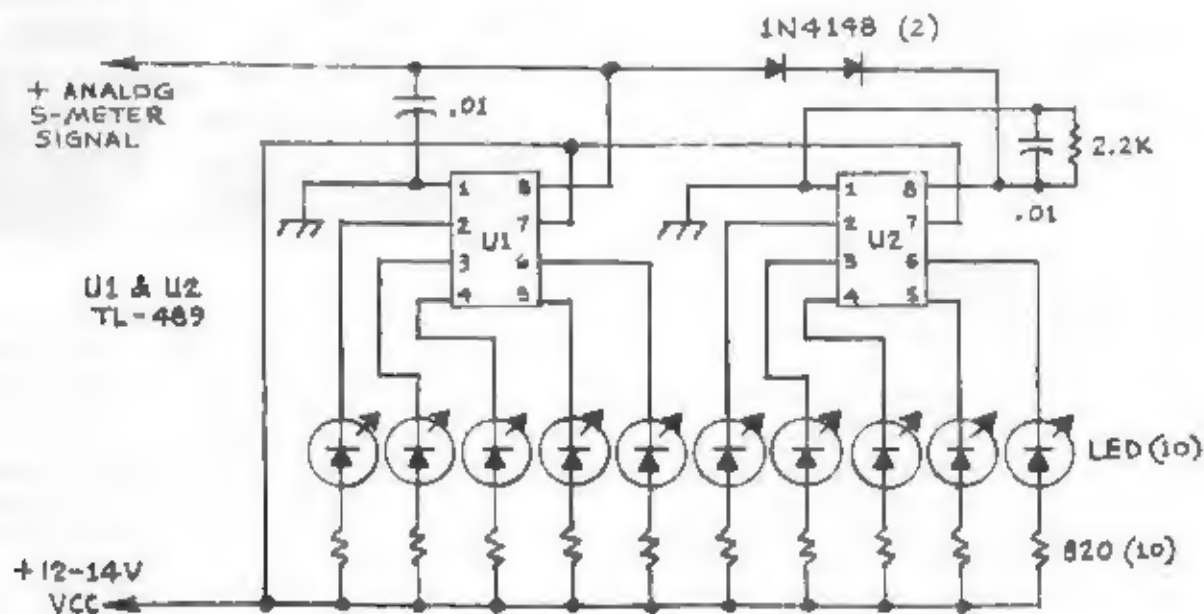
input impedance of 100K ohms, placing little burden on the S-meter circuits of the receiver.

This will not be a construction article, since each mobile operator will have his own preferences as to configuration and placement. This unit was designed to be compact and remote from the rig, so it could be placed high on the dashboard, directly in line of vision while driving. It is mounted in a Bud Econobox, CU-123, 3 5/8" x 1 1/2" x 1 1/4", painted flat black. I advise adding an "eyebrow" or sunshade for the LEDs for improved daytime display. All parts are contained in the miniature chassis, and it is stuck to the dashboard with double-sided carpet tape. A three-wire skinny cable interfaces the unit to the rig. Power requirements are 12.5 mA no signal and 160 mA for all ten LEDs turned on.

Since this unit was installed, a whole new respect for "signal strength" has evolved. There is no inertia. Readings are instantaneous. A string of LEDs, either vertical or horizontal, gives you an immediate "feel" for the incoming signal's strength. You don't count 'em, you perceive 'em. Honestly, when you are working simplex, in motion, you can instantly see the reason for QSB on the other guy's signal. When searching out a strange repeater, you know when it is too marginal to call in, etc. Automobile QRN can be searched out and eliminated by observing the S-1 LED. Squelch sensitivity is not affected. Mountain topping is fun, because you can really adjust to instantaneous perceptions of the other person's signal. Optimizing a beam antenna azimuth is easy, as well.

Much progress has been made in the areas of voltage comparators since this project was first built. National Semiconductor has come out with an IC with the ten levels built in. Available in either linear or logarithmic steps, these little gems even include the current limiting resistors for the LEDs. Look for LM3915, an 18-pin IC which will drive 10 LEDs in a row with 3 dB between steps. These and rectangular LEDs which can be stacked, are available at Radio Shack. Man! If I had just waited a little longer for progress to progress! I have built a breadboard version, using the LM3915 and rectangular LEDs. The display housing need be only two inches long with this combination.

Oak, KØROL



Perf-board layout available — see Don KBØKQ

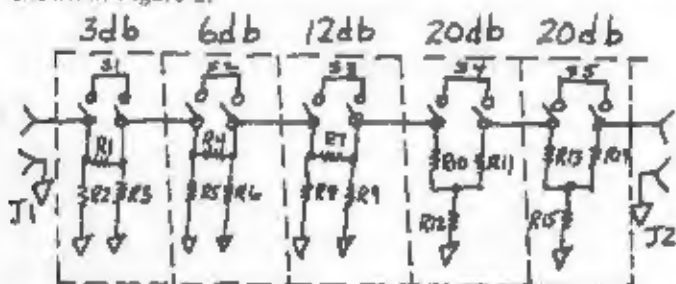
Transmitter Hunting (cont.)

Yagis will exhibit several peaks as you turn them, but the highest peak is the one you want. You can also verify this by rotating the antenna 180 degrees from the proper peak and the signal strength should take the largest dip.

As you drive in the direction your antenna leads you the signal should get stronger. As you move, you should watch for new strong peaks in other directions showing up. If this happens you can be experiencing signal bounce (remember the mountains, metal buildings, etc.). In this case you could drive at a 90 degree angle from the strongest peak for a few blocks (more if necessary) and try to look back with the antenna to see if all but one peak disappears. When this happens and the peak is in the same general direction as one of the first peaks you are reasonably sure you're still on the right track.

The hunt continues in this manner until you find the transmitter.

Now we are back to the how to acquire an attenuator. I mentioned you can usually build or borrow one. Borrowing sounds easier than building, however, building isn't as hard as it seems. If you look on pages 263 and 264 of the 1973 Amateur Handbook you'll see two types. The better one of the two is the one with toggle switches. The schematic is shown in Figure 2.



$R1 - 19 \Omega$
 $R2,3 - 330 \Omega$
 $R4 - 33 \Omega$
 $R5,6 - 150 \Omega$
 $R7 - 91 \Omega$
 $R8,9 - 82 \Omega$
 $R10,11 - 43 \Omega$
 $R12 - 11 \Omega$
 $R13,14 - 43 \Omega$
 $R15 - 11 \Omega$
 $S1-5 - DPDT \text{ TOGGLE SW}$
 $J1,2 - \text{RF CONNECTOR}$

Figure 2

When building this attenuator I recommend adding at least 2 additional sections of 20 db each in order to have at least 100 db total. More sections can be added if desired.

Rules of the game. Yes, there are some basic rules.

For the hunter:

1. The winner is one that finds the transmitter with the lowest mileage on the odometer. Beginning mileage is reported to the hidden operator from the starting point.
2. Time is used only for tie-breaking. Anyone caught speeding is disqualified.
3. Hunters should use the shortest paths if possible, however 4 wheel drive owners must not use any path a conventional 2 wheel drive cannot use.

For the huntee:

1. The transmitter can be hidden anywhere in El Paso County on *Public Property* with one exception - Manitou Springs.
2. The transmitter should not be hidden anywhere that requires special vehicles for access. It must be accessible to any 2 wheel-drive vehicle.
3. The operator may move the equipment away from his vehicle, however common sense distances must be considered - let's not forget everybody is not a certified mountain climber and everybody may not be portable equipped.

4. Different power levels, antenna types, directions and polarities may be used; however, don't make it impossible for the hunter.
5. The operator will transmit for one minute out of every 5 minutes, using proper ID techniques and briefly describing what is going on for those tuning across the frequency. should answer anyone requiring more signal, however, the hunter should not take advantage.

Now for those who don't have signal strength meters, refer to figure 3 for a system for hunting. Connect an

Continued on Page 5 -

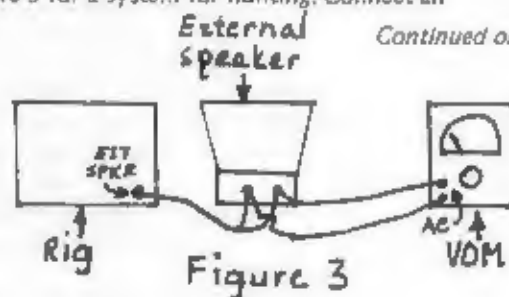


Figure 3

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From the President . . .

A couple of things this month that need to be mentioned. We record with regret the passing of Jim Reynolds W0JMB. Jim and I met only once, but he impressed me as a most remarkable man, who never tired of learning, and in the few minutes we spent together, I learned much. Jim gave a lot of his time and effort to the club before health problems curtailed his activities somewhat. His interest remained though, and he was very interested in getting prospective hams off to the right start. I count his loss with great sadness.

Now to a lighter note. I read in the paper the other day that the Olympic Committee was asking for authority to start planning a possible Sports Festival III here this summer if the Moscow games do not materialize, or if our athletes stay home. Food for thought and maybe some planning. Dave Stivers, where are you?

Transmitter Hunting (cont.)

external speaker to your rig and connect a VOM across the two speaker terminals. Take extreme care not to short the output of the rig. Select an AC volts range that will give at least a half-scale reading when the receiver is unskelched and the volume is normal. When the transmitter is on you turn your antenna for the noisiest condition and watch the VOM for a peak. You must use enough attenuation to have noise in the audio. Now you have a direction to follow. **CAUTION!** The front end of your antenna is now pointing away from the transmitter! You must follow the opposite antenna heading you would if you had a signal strength meter on the rig.

You will notice the noise will cause the meter to jump. Don't let that bother you because the jumping will decrease as the noise increases.

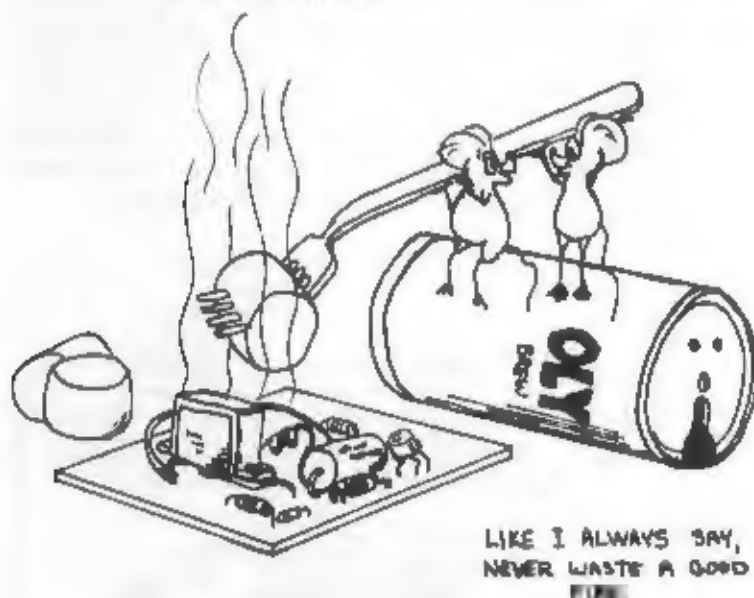
I think this article provides enough information for anyone to get started in transmitter hunting. There will be more information available at this month's club meeting from some of the experienced hunters. There will also be a few attenuators on display to give beginners more confidence in the unknown.

If you would like to experience TX hunting once with an experienced hunter, don't hesitate to let us know. If interested contact me at 599-9605, Dave WB0SDW, or Ray AA0L (numbers in Zero Beat under officers).

Don't forget Saturday, March 8th is the day. Time is still being discussed, but will be decided soon. See you there.

73's Doug Moloney
WB0MHP

P.S. I hope to catch everyone's attention! Do Not transmit through your attenuator when you have any attenuation selected. Most attenuators will allow 1 to 5 watts to be transmitted through them in 0 db setting. If you're not sure about yours, check with us.



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PUBLIC SERVICE

Amateur radio is a great hobby, but this fact alone would hardly merit the wholehearted support given it by nearly all the world's governments at international conferences. There are other reasons. One of these is an appreciation of the value of amateurs as sources of skilled radio personnel in time of war. Another asset is best described as "public service."

The "public service" record of the amateur is a tribute to his work. Amateur cooperation with expeditions began in 1923 when Don Mix, 1TS, accompanied MacMillan to the Arctic on the schooner Bowdoin with an amateur station. Amateurs in Canada and the U.S. provided the home contacts. The success of this venture was so outstanding that other explorers followed suit. During subsequent years amateur radio assisted perhaps 200 voyages and expeditions, the several explorations of the Antarctic being perhaps the best known. And this kind of work is not all in the distant past, either: In 1978 Japanese explorer Naomi Uemura, JG1QFW, became the first person to trek to the North Pole alone. Amateur radio, through member stations of the National Capitol DX Association and the Polar Amateur Radio Club, VE8RCS, at Alert, NWT, Canada, provided important backup communications.

Sometimes Mother Nature goes on a rampage — with earthquakes such as those in Alaska in 1964, Peru in 1970, California in 1971, Guatemala and Italy in 1976; floods like those in Pennsylvania and New York in 1972, Big Thompson Canyon in Colorado 1976, Kentucky, Virginia, West Virginia, and Johnstown, Pennsylvania in 1977; the big forest fires in California in 1977; tornadoes, hurricanes and typhoons, most anywhere, any year, and the blizzards of 1978. When disaster strikes amateurs are ready with equipment not needing power from the electric company, to carry on communications for police, fire departments, and relief organizations. The ability of radio amateurs to help the public in emergencies is one big reason amateur radio has survived and prospered.

Frank, WB0PAJ

Information from Radio Amateur's Handbook

FOR SALE: Heath SB 303 — Solid State 80-10 meter Rcvr. Very good condition. \$200 firm. Mike K0TER

BOARD MINUTES

The meeting was called to order by Don Lohse, KBØKQ, on January 7, 1980 at the home of Frank Freiler, WBØPAJ.

Members present were Frank WBØPAJ, Dave NØDV, Don KBØKQ, Art WAØAEH, Dave WBØSDW, Ray AAØL, Lorna WDØBTF, and Charleen WBØYOB. Visitors present were Bud WBØTIB, Dick WBØPNX, Len WD6AMZ, and Jim NØAVY.

Don KBØKQ led a discussion on by-laws changes that should be considered. Dave WBØSDW moved that we get a committee together to clean up the by-laws and present them to the club via Zero Beat to be voted on by the club six weeks later. All agreed. Don will ask for volunteers at the meeting. Don KBØKQ questioned incorporation of the club. It has not been done recently. We will look into this also.

Len Schwartz, WD6AMZ gave a presentation to the board on using the basement of his motel as a possible location for the club station. Doug, WBØMHP will be asked to organize a transmitter hunt on March 8 starting at 3:00 p.m. from in front of Radio Shack, Garden Ranch Shopping Center. Don, KBØKQ presented a bill for \$5 from The Letter Setters for supplies used on Zero Beat. It was moved and seconded to pay the bill. Don also stressed the importance of getting articles and information for Zero Beat in early. In discussing the Swap Fest it was pointed out that businesses such as Ampex, Hewlett Packard, TRW, etc., should be contacted for donations of door prize materials in January. Also if no one in the club wants to chair a food committee it be offered to the P.P.F.M. Assn. as a money making project for them. Gary Palmgren of Colo. Motorcycle Trailriders Assn. wishes to speak to the club and express his regrets that there is no money to give to the club this year, but how much they appreciated the club's assistance on the Woodland Park Enduro. Mountain Bell will not have a representative available to give a program on Microwave at the January meeting. Don will look into getting a program.

Requests for transmitters for novices is still a prime topic. Transmitter loans would be for a limited time to get a novice on the air and encourage the purchase of his/her own equipment.

Still zero response for a person or persons interested in being Emergency Coordinator for Servcom or SCM. Warren Rubin WBØSJR, is now teaching novice theory. Bud WBØTIB, will check into the possibility of another amateur radio display at the Mall of the Bluffs.

The meeting was adjourned at 9:30 p.m. so all could partake of fine refreshments serve by Frank.

The next meeting of the board will be at 7:30 p.m. February 4, at 4610 Topaz Drive, home of Jim NØAVY and Charleen WBØYOB. Remember these are open meetings and your suggestions and opinions are welcome.

Respectfully Submitted,
Charleen, WBØYOB

ARRL BULLETIN 128

To all Radio Amateurs:

The FCC has relaxed its requirement that the original Operator's License be in the possession of the control operator of an amateur station. Effective Dec. 21, 1979, a photocopy will be sufficient. This is a modification of Section 97.82 of the Commissions's rules.

Typesetting courtesy of THE LETTER SETTERS • 635-7469

NOTICES

Anyone owning a step attenuator: We would like to have a show and tell about attenuators at this month's meeting for transmitter hunting beginners. If you have one, home-brew otherwise, please bring it to the meeting.

WBØMHP

RAMBLINGS . . .

There's been a disturbing thought floating through my mind of recent months. Just over a couple of years ago when Charleen and I were first exposed to Amateur Radio there were quite a number of XYLs coming to the meetings. These ladies are really conspicuous by their absence of late. The question probes my mind — How can we revive some interest (and help) from these lovely ladies? A fact of note: Our most recent frustration in getting the food concession at the Swap Fest.

Talking about help — How would the membership like an article in Zero Beat by Al Bailey, ADØZ, Phased Arrays? Maybe a small dissertation by Oak Stockton, KØROL, on solar panels that charge batteries would pique someone's interest. I'll bet an article on antennas and feed lines by AAØL could stir up a bit of thought (controversy). I'm sure there's a contestor out there that could profit from an article by Dave Vierling NØDV. How about you would-be Satellite Devotees — could you use some data on the Amateur Satellites and their use by Ed Means, WØVO. I know I'd enjoy a joint article by Tom Purdon, ABØA and Bob Keller, ABØF on DX, the how's, when's, and what's. At any rate fellows you can consider yourselves asked, coerced or strong-armed into the above mentioned articles.

As most of you know the upcoming club event, The Ides of March Transmitter Hunt is to be held on the 8th of March, starting point — Radio Shack, Garden Ranch Shopping Center — 3:00 p.m. Followed by a Pizza Bash. If the weather permits WBØYOB and I will try on the motorcycle and we don't even know how to point an antenna. By the way "What's an Attenuator?" If you don't know, see the article (elsewhere in this issue) by A2 Zip L, Ray U. (can't spell last name).

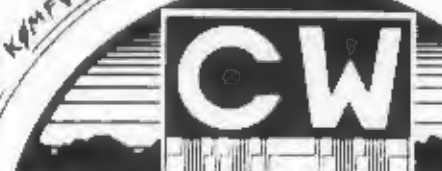
Rambling Over,
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NEW HAM ON THE HORIZON:

WBØWVJ has given birth to a baby boy. Father, WBØWSJ doing fine.

MEETING NOTICE

The monthly meeting of the Pikes Peak Radio Amateur Association will be on February 13, 1980 at 7:30 p.m. All members are urged to attend. There will be a double program, on narrow band voice modulation and transmitter hunting.

SWAPFEST

The PPRAA Swapfest will be held on April 27, 1980, hopefully at Peterson Field. More information later.

ATTENUATORS

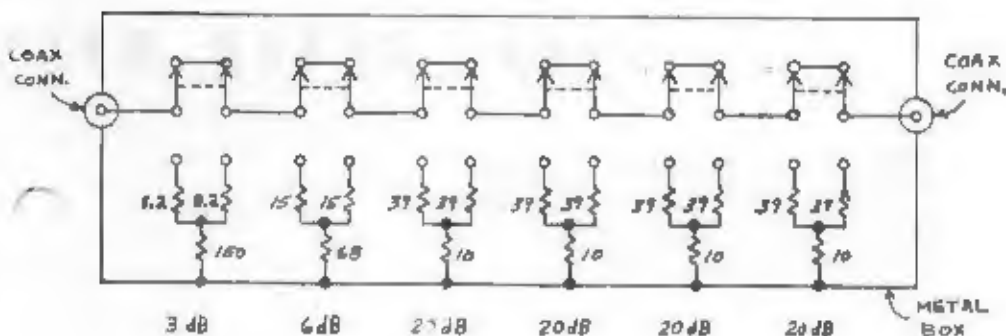
A necessary piece of equipment for use in transmitter hunting, especially when the receiver consists of an FM transceiver is an attenuator. The attenuator provides the operator a means of controlling the signal level to the receiver to maintain a useable reading of the signal strength meter. A fairly high degree of attenuation is required when the hunter is nearing the location of the hidden transmitter.

Several methods are available to achieve the level of attenuation (approx. 100db) necessary. A schematic is included showing a switch selectable attenuator using common components and can be constructed in the home workshop. The only precaution necessary in construction is keeping leads short and providing some shielding between the attenuator sections. The design shown is not intended to provide highly accurate attenuation levels but instead, to use easily obtainable parts. An attenuator of this type is bidirectional i.e., the input and output can be reversed. A word of caution when using any attenuator; REMEMBER to switch out all attenuation when transmitting or else keep plenty of marshmallows handy.

Several other attenuation methods are also available. A type known as a trombone is the type commonly used in signal generators although this type is a little harder to construct. Another type which is not too difficult to construct uses two coupling loops in a box and the operator swings a vane or shield in between the coils. In this type the vane needs to be well grounded to the case to prevent coupling around it. Just follow good shielding techniques. These latter two attenuators do not go to 0db so you cannot transmit through them without loss or possible damage.

Several attenuators as well as antennas and other necessary items for transmitter hunting will be available for show and tell at the February Meeting.

Good hunting to all.
Ray AAØL



ALL SWITCHES MINIATURE DPDT
RESISTORS 1/4 WATT FILM OR CARBON

A.E.S. Communications

404 Arrawanna

Colorado Springs, CO 80909

475-7050

- | | |
|----------------------|-------------------|
| • AZDEN | • HYGAIN |
| • AMPHENOL | • LARSEN |
| • KDK | • VHF ENGINEERING |
| • DENTRON | • NYE VIKING |
| • CUSHCRAFT | • TEMPO |
| • ASTATIC | • YAESU |
| • ARRL & AMECO BOOKS | • KENWOOD |
| • HUSTLER | • TURNER |

TRADE-INS & CONSIGNMENTS WELCOME

VISA/MASTERCHARGE

9 — 5:30 Monday — Friday 9 — 1:00 Saturday

DAVE WDØCDU • TOM WDØEMN • JERA NØAGT

NOVICE LOANERS

The novice rig loaner program has started out with a bang — literally! After a successful tryout and QSO at my shack I sent off Mike, KAØGMO, to try it at his own QTH. On goes the rig — up comes the smoke — and I forgot to send marshmallows along. Thanks to the ham spirit I was able to get him another rig to use and reports are that everything is now F.B. Mike wants to thank the club for all the help and encouragement.

We would like to thank all of you who have offered help and equipment for this project. If we haven't contacted you yet, don't feel left out. Your phone will ring soon.

We will have another rig to offer very shortly so if you need help, give us a call.

—73—

Dave, NØDV

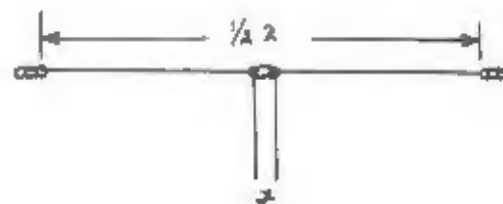
Dave, WBØSDW

"RESONANT DIPOLE"

1/2 wavelength long

Feedpoint Impedance 25—100 ohms
70 ohms nominal

$$\begin{aligned} \frac{1}{2} \text{ wavelength (feet)} &= \frac{468}{f(\text{MHz})} \\ \frac{1}{2} \text{ wavelength (metres)} &= \frac{142}{f(\text{MHz})} \\ \frac{1}{2} \text{ wavelength (inches)} &= \frac{5610}{f(\text{MHz})} \end{aligned}$$



PIKES PEAK RADIO AMATEUR ASSOCIATION MEMBERSHIP APPLICATION

Name _____ Call _____

Address _____

Phone _____

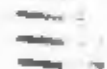
Type of membership Regular — \$6 ☐ Family — \$2 per member ☐ Associate — \$4 ☐
w/Regular membership



Ø BEAT



COLO. SPRINGS,
COLORADO



Jim Colvin NØAVY
4610 Topaz
Colorado Springs, CO 80918



FIRST CLASS MAIL

DON SCHAARSCHMIDT WØOTZ
STEVE SCHAARSCHMIDT KØOI
2208 E GREENWICH CIR
COLO SPGS, CO 80909